Climate education in the deep time perspective: working with teachers and students

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Climate science is a complex interdisciplinary field of knowledge, to which many scientists from different fields can contribute (physics, chemistry, mathematics, engineerings, social sciences, economics…). Among these, Earth sciences can contribute to climate science, and in particular to the understanding of thermal maxima in Earth history, since sedimentary rocks can record valuable information about past environment, climate, and biota just before, during and after the perturbation. The geological record offers a unique approach, not shared by other sciences, that allow to understand how the biota responded to climate change and how they coped in past high CO_2 worlds. After the establishement of the Intergovernmental Panel on Climate Change in 1988 and the United Nation Rio de Janeiro Earth Summit, held in 1992, both governments and scientists are working to address the subject of climate change. This subject has been a matter of exclusively scientific and political debate for long time, but recently has become a very common concern among the public, and more so in the last year, since the beginning of the movement Fridays For Future, that asks governments to respect the 2015 Paris agreements on keeping the temperature rise below 2 degrees and stop increasing greenhouse gas emissions as soon as possible. As for other scientific subjects impacting everyday life (such as volcanic and seismic risks), it is very common to come across scientific misconceptions when interacting with the general public, mainly due to the very limited scientific literacy of the people. We applied the geological approach to the subject of climate change with teachers and students, in order to eliminate misconceptions and overcome the cognitive obstacles related to the time scale at which the process of climate change takes place and to the amplitude of its impact. First we held a class for teachers only, on how to communicate and teach the subject of climate change. We used geological examples useful to understand the time frame of the change (e.g. the Paleocene/Eocene thermal maximum, climate change at the precessional scale, such as Mediterranean sapropels formation), and prepared lab and field exercises that can be reproduce by the teachers alone with their students. The lab exercises have been designed to encourage reflection on the geological time scale of the change, both studying data on fossil populations and on the depositional regime. The field exercise held with the students were useful to reinforce the concept of the time scale of the change and the extent of the impact (even a small change has an important impact). The outcome of the project is to improve the scientific literacy of both teachers and students, stimulating the reflection on the difference between geological and man-made climate change, and boost virtuous behaviour that can diminish the human impact on the current climate change.